

CHelsea Creek Community Based Comparative Risk Assessment

CHAPTER 1: WATER QUALITY

1. Overview of Water Quality in the Chelsea Creek

The Chelsea River (the Creek) runs southwest between Chelsea and East Boston in Massachusetts and flows into Boston Inner Harbor as part of the Mystic River Watershed. Most of the land surrounding both sides of the Creek is a Designated Port Area (DPA), meaning that it has been set aside by the State of Massachusetts for industrial and commercial uses that need water access. Most of the land next to the Creek is used by industrial and transportation related businesses including fuel depots, small marinas, petroleum or oil storage, a multi-ton road salt pile, and satellite parking for Logan Airport. These businesses, individually and collectively, create many potential sources of pollution for the Creek. In addition, because the area surrounding the Creek is highly developed with mostly paved surfaces and heavy car and truck traffic, “non-point source pollution,” or contaminants washing into the Creek are also a source of water pollutants. Understanding the quality or safety of the water in the Creek is a priority for local residents. Exposure to contaminated water can affect public health and is an important part of determining safe and appropriate uses for Chelsea Creek.

Water Quality Regulations: The United States Environmental Protection Agency (EPA) regulates water quality through the Clean Water Act (CWA) and releases (also called discharges) to water bodies such as the Creek through the National Pollutant Discharge Elimination System (NPDES) program. The NPDES program requires that facilities discharging water into the Creek obtain permits with specific pollutant limits and report the level of contaminants in the release (also called effluent). The frequency of reporting varies on each permit. NPDES is largely a self-regulated program that relies on the permit holder to report information on releases. There is limited oversight or federal monitoring, but there are strict penalties for falling out of compliance or falsifying data. There are also NPDES permits for municipalities with storm sewer systems. The City of Boston is already permitted, and the City of Chelsea is also scheduled to undergo permitting.

The Massachusetts Department of Environmental Protection (MA DEP) also sets standards for water quality. Under the Massachusetts Water Quality Standards, the Creek is classified as an SB Class body of water, meaning that it has the potential to be a habitat for fish and other aquatic life and used for swimming, boating, and restricted shell fishing. The SB Class water quality standards are listed in Table 1. Currently, the Creek does not meet standards for ammonia, excess organic material, dissolved oxygen, pathogens, oil and grease, taste/odor/color, and turbidity (cloudiness).

Table 1 Class SB Water Quality Standards	
Dissolved oxygen	\$ 5.0 mg/L and \$ 60% saturation unless background conditions are lower
Temperature	# 85° F (29.4° C) or a maximum daily mean of 80° F (26.7° C) and \hat{I} * 1.5° F (0.8° C) between July through September and \hat{I} 4.0° F (2.2° C) between October through June.
pH	6.5 - 8.5 and \hat{I} 0.2 outside the normally occurring range
Fecal coliform bacteria	Approved Restricted Shellfish Areas: < a fecal coliform median or geometric mean (MPN method) of 88 organisms/100 ml and <10% of the samples > 260 organisms/100 ml (MPN method) Waters not designated for shellfishing: < a geometric mean of 200 organisms in any representative set of samples, and < 10% of the samples > 400 organisms/100 ml. (This criterion can be applied on a seasonal basis at the discretion of the DEP).
Solids	These waters shall be free from floating, suspended, and settleable solids in concentrations or combinations that would impair any use assigned to each class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.
Color and turbidity	These waters shall be free from color and turbidity in concentrations or combinations that are aesthetically objectionable or would impair any use.
Oil and Grease	Waters shall be free from oil and grease, petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course or are deleterious or become toxic to aquatic life.
Taste and Odor	None in such concentrations or combinations that are aesthetically objectionable, that would impair any use assigned to each class, or that would cause tainting or undesirable flavors in the edible portions of aquatic life.
Aesthetics	All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits, float as debris, scum, or other matter to form nuisance species of aquatic life.
Toxic pollutants	All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life, or wildlife... The division shall use the recommended limit published by EPA pursuant to 33 USC 1251, 304(a) as the allowable receiving water concentrations for the affected waters unless a site-specific limit is established.
Nutrients	Shall not exceed the site-specific limits necessary to control accelerated or cultural eutrophication.

* \hat{I} criterion (referring to a change from ambient) is applied to the effects of a permitted discharge.
Source: Massachusetts Surface Water Quality Standards, 314 CMR 4.05b, July 28, 1999

2. Review of Existing Chelsea and East Boston Water Quality Information

There are two major types of water pollution: point sources which directly flow from a specific location like a pipe; and non-point sources which include indirect pollution from sources like rain water that washes contaminants from streets and parking lots and runs into the Creek.

Point Source Pollution: All point sources must obtain a NPDES permit. There are eleven point source permit holders that directly send (or discharge) pollution into the Creek, including nine oil companies. The other two permit holders are the City of Chelsea and the Massachusetts Water Resources Authority (MWRA). Both have permits to discharge combined sewer overflow systems (CSOs) waste into the Creek during a heavy rain storm. CSOs are pipes that discharge untreated sewage and waste to the Creek when storm water systems are overloaded by heavy rains. Because of the way that sewer pipes were designed and built years ago, the CSOs act as escape valves and release excess flow to the Creek. Since the sewer system collects waste from industries and local households, CSOs may contribute different kinds of pollutants including heavy metals and pathogens to the Creek during heavy storms.

The nine oil companies that discharge into the Creek are required by NPDES permits to monitor their discharge for volume (amount flowing into Creek), total suspended solids, oil and grease (O&G), selected polycyclic aromatic hydrocarbons (PAHs), methyl tertiary butyl ether (MTBE), and BETX (benzene, ethylbenzene, toluene, and xylene). There are daily maximum levels set by permit for flow, total suspended solids, O&G, and benzene. Other factors must be reported, but there are no limits on what is released to the Creek. Most of the NPDES permits in existence today were last renewed in 1997 and companies are required to apply to renew these permits every five years.

Petroleum Companies with NPDES Permits Discharging to Chelsea Creek

Gulf Oil
Coastal Oil New England (Global-Revco
Terminal)
Coastal Oil of New England
Northeast Petroleum
Global South Terminal
Irving Oil Terminals (formerly Bayway Refining)
Global Petroleum
Chelsea Sandwich
Tosco East Boston Terminal

Non-Point Source Pollution: Stormwater runoff and unregulated releases (or spills) of oil or hazardous waste are the main non-point sources of pollutants for the Creek and the watershed. A watershed is the area which drains into a common body of water. For the Chelsea River, this includes areas bordering the Creek and a wider area up to 1 mile away from the water. In a densely developed area like Chelsea Creek, stormwater runoff is a problem because of the amount of pavement. Pollutants that are deposited on paved surfaces such as oil drips, tire wear, animal waste, and chemicals within the watershed area

are washed into storm drains and into the Creek during rainstorms.

Sites contaminated with hazardous waste or oil spills are called 21E sites, after the MA DEP Act which regulates these sites. Spills from 21E hazardous waste sites and the petroleum storage terminals also harm the Creek's water quality. Since 1997, there have been at least 40

petroleum spills documented in Chelsea Creek, including one spill of 58,000 gallons in 2000, accounting for a total of over 100,000 gallons of oil, #2 fuel, gasoline, diesel fuel, and jet fuel. Some of the 21E sites have been cleaned up, but unidentified or unmitigated sites may continue to affect water quality by leaching (or slowly draining) from contaminated groundwater and sediment around the Creek. A 1999 study of 21E sites near the Creek estimated that the volume of oil polluting groundwater could be as high as 206,000 gallons of oil in East Boston and 928,600 gallons in Chelsea (U.S. EPA, 1999). Remediation (cleanup or removal) and migration (movement) of oil since these spills may have reduced the level of oil currently in groundwater, but it is possible that contaminated groundwater continues to serve as a source of pollution to the Creek. Because all of the fuel for Logan Airport and much of the heating fuel for New England is transported through and stored along the Creek, there is a chance that future spills may also occur.

Another non-point source affecting the Creek is atmospheric deposition which happens when air pollution settles into the water or onto land and washes into the Creek. Some common air pollutants include emissions from vehicles and industry. More information on air pollutants can be found in Chapter 2. The road salt pile along the Creek at the Eastern Minerals storage facility is also a potential source of water pollution. The fence barriers installed do not fully contain all of the road salt stored there throughout the year and some amount likely blows from the partially uncovered pile into the Creek from storage or spills during unloading of salt from barges to the pile and loading of trucks from the site. While the Creek does contain salt water, it is not known whether increased salinity would negatively impact aquatic life. The chemical anti-caking additive to the salt, ferro cyanide, may also create environmental and public health problems because of the potential for leaching of the salt into the Creek or the conversion of ferro cyanide to a gaseous form when exposed to sunlight (Chelsea Green Space and Recreation Committee, 2000).

3. Analysis of Existing Water Quality Data

Despite the many potential impacts on water quality in the Creek, there has been very little data gathered on Creek pollutant levels. Table 2 is a summary of all of the sampling events identified for the Chelsea Creek. In the last decade, there has been only one sampling location along the Creek used to assess and monitor the Creek's water quality. The site, Station 27 (see attached map) is located in the center of the Creek between Highland and Willow Streets in Chelsea. It should be noted that this lack of data is not rare, and in fact many of the rivers throughout the state lack sampling programs. While there is a need to increase water quality sampling across the state, more frequent sampling in urban areas such as the Chelsea Creek community is particularly warranted since the potential for

environmental and health impacts is so high.

The MWRA samples water at both the surface and at the bottom of the Creek and tests for bacteria counts, dissolved oxygen, temperature, salinity, and turbidity. A review of the data shows that Chelsea Creek water quality has generally improved since 1970. Water quality is also subject to great fluctuation depending on the tide and the amount of rain that has fallen before samples are taken. It is likely that one sampling point does not fully show the water quality throughout Chelsea Creek. Intensive sampling at different points along the Creek would help to determine the variability of water quality.

There is currently no on-going sampling program to monitor for the presence of PAHs or heavy metals in the Creek. The presence of heavy truck and car traffic near the Creek as well as petroleum storage makes it likely that PAHs are entering the Creek through both point source discharges and runoff. Since some PAHs are classified as probable carcinogens, the lack of data is a concern. A review of available water quality data, as summarized in a MA DEP report submitted to the EPA, indicates that the Chelsea Creek does not meet CWA standards for surface water quality for pathogens, oil and grease, dissolved oxygen, unionized ammonia, turbidity, and taste, odor, and color (1999).

There is also a lack of information on the pollution and contamination in the sand or sediment at the bottom of the Creek. These sediments can hold large concentrations of pollutants that seep over time into the water. Although dredging takes place in the Creek to remove sediments and increase Creek depth for commercial use, and disposal of dredge spoils requires analysis to be done, little information on sediment quality was identified for this project.

4. Potential Concerns for Public Health and the Environment

Water quality in the Creek was identified through the Comparative Risk Assessment process as a priority of the residents of the area because of the potential impacts on public health. The current DPA restriction limits public recreation because of the high volume of traffic in the Creek. Residents of East Boston and Chelsea have been working for many years to change the DPA designation and improve local access and recreational use for the community. Improved water quality will also be necessary before local restoration efforts can succeed.

The contaminants of greatest concern in the Creek include:

Contaminant	Public Health Concerns
<i>Pathogens</i>	Pathogens include bacteria, viruses, and other disease causing organisms. They may be present in the Creek because of CSOs or because of runoff from animal waste in the area surrounding the Creek. Pathogenic contamination is a concern if people will be swimming or boating or eating fish from the Creek.
<i>Polycyclic Aromatic Hydrocarbons (PAHs)</i>	PAHs are a group of over 100 different chemicals which are formed during the incomplete combustion of coal, oil and gas, and other organic materials. The presence of PAHs in water can indicate oil or gas contamination. Some PAHs have been found to cause cancer. In addition to the toxic effects of PAHs, oil spills can impose negative impacts on the ecosystem. All species who use the Creek for food and habitat may be harmed through inadvertently ingesting oil or by getting coated with the oil which can lead to drowning or suffocation.
<i>Polychlorinated Biphenyls (PCBs)</i>	PCBs are another group of organic chemicals that were used in industry. PCBs do not degrade readily, so although the use of PCBs has been banned for many years, PCBs can still be found in many waterways including Chelsea Creek. PCBs accumulate in fish and mammals and may cause a range of health effects including cancers.
<i>Heavy Metals</i>	Heavy metals such as zinc, copper, and lead are toxic to plants and animals, including people. Metals may accumulate in aquatic species.
<i>Other Parameters</i>	Some water quality parameters such as pH, salinity, and dissolved oxygen may not be a concern regarding human health, but may affect aquatic species.

5. GIS Maps of Available Water Quality Data & Information

The attached map shows the locations of permitted point source discharges along the Creek. The sampling location, Station 27, is the only current long-term location for sampling water quality.

6. Current Water Quality Projects or Activities in Chelsea and East Boston

It is unlikely that the Creek will be safe for swimming while CSOs exist. The MWRA is currently working to eliminate CSOs as part of a Boston Harbor clean up, but this project is not scheduled to be completed until 2005. Until that time, heavy rains will continue to result in overflow of untreated sewage into the Creek during storms. Monitoring the level of pathogens in the Creek following heavy rainstorms could help residents determine if use of the Creek for boating or swimming is safe. There are also several active projects working to characterize water quality and sediment in the Mystic River which may include some data close to Chelsea and East Boston.

7. Greatest Water Quality Concerns for Chelsea and East Boston Residents

NOTE: There is a map associated with this chapter - download the map entitled: NPDES and CSO Discharges into Chelsea Creek

The greatest water quality concerns for Chelsea and East Boston residents is that there is currently a lack of information to understand the extent of water quality and sediment quality in the Chelsea Creek. Without this information, it is very difficult to identify the greatest public health risks currently facing local residents. Although there are no official community access points to the Creek, there are areas where fencing has broken down and some residents could be directly exposed to the water and surrounding soil. Some residents might also be exposed to contamination by eating any fish or wildlife caught in the area. Current projects to increase access to the Creek through open and green space like the Condor Street Urban Wild should make sure that safe use of the Creek is a priority.

8. Recommendations to Address the Greatest Water Quality Problems

Many of the recommendations are related to improving the data available on water quality. Other recommended actions focus on reducing the amount of pollution going into the Creek. Finally, recommendations address personal actions that can be taken to protect residents from the water pollution.

Community Actions

- Develop volunteer programs to supplement State sampling.
- Work with agencies to increase oversight of NPDES permit holders to ensure compliance and verify data.
- Work with MWRA to fast track the elimination of CSOs along the Creek.

Longer Term Priorities

- Conduct sediment testing to determine the level of pollutants trapped in sediments and the remediation efforts necessary to minimize ecological or public health impacts.
- Increase testing requirements by adding sampling sites and sampling parameters.
- Require permitted dischargers to more closely monitor the quality of receiving water.
- Conduct biota studies to determine the biodiversity of plants, fish, and other aquatic species in the Creek to assess the impact of pollutants on living organisms.
- Test storm water for pollutant levels to determine the impact of non-point pollutant sources.
- Implement wet weather testing to determine the impact of rainfall on Creek water quality and how long impact lasts.
- Remediate 21E hazardous waste sites.
- Increase amount of unpaved areas to absorb excess rainwater and reduce stormwater runoff.

- Request government agencies to report on cumulative effects of existing pollution sources when considering new water quality.
- Reduce non-point pollutant sources by reducing vehicular traffic and by enforcing animal waste regulations.

Personal Actions

- Limit direct contact with the water, particularly after heavy rainfall. Wash hands with soap and water if residents do come in contact with the water.
- Don't eat fish, plants or any wildlife in or around the Chelsea Creek.

9. Contact List

The following is a list of government agencies and community organizations which are involved in the management, monitoring, or advocacy for the Creek.

U.S. EPA New England

MA NPDES Permits, Brian Pitt (617) 918-1875
 MA Combined Sewer Overflows, Mark Voorhees (617) 918-1537
 MA State Unit Chief, David Webster (617) 918-1791

Massachusetts State Programs

MA Riverways Program, Cindy Delpapa (617) 626-1545

Community Organizations

Chelsea Creek Action Group, Stacey Chacker (617) 569-0059 x13
 Chelsea Greenspace and Recreation, Roseann Bongiovanni (617) 889-6080
 Mystic River Watershed Association, Nancy Hammett (781) 316-3438

References:

Bryan, Annette, Karen Henry, and Carmen White. *Identification and Evaluation of Pollutant Inputs in an Urban Watershed: A Study of Chelsea Creek*. Tufts University, 2001.

U.S. EPA. *Chelsea River Oil Hazards Survey*. 1999

<http://cfpub.epa.gov/npdes> - The EPA website on the NPDES program

<http://www.mwra.state.ma.us/sewer/html/sewco.htm> - The Massachusetts Water Resources Authority (MWRA) website on combined sewer overflows (CSOs)